

Materials Safety Division Integrated Safety Management Plan

Policy Statement

The Materials Sciences Division (MSD) has implemented an Integrated Safety Management (ISM) program that meets or exceeds all of the standards described in LBNL institutional policy and procedure documents, including:

- The Regulations and Procedures Manual (RPM, PUB-201)
- The Health and Safety Manual (PUB-3000)
- The Integrated Environment, Health & Safety Management Plan (PUB-3140)
- The Operating and Assurance Plan (OAP, PUB-3111).

This ISM Plan implements the LBNL Integrated Safety Management program within the Division. The plan establishes the mechanisms and management strategies that will ensure that all institutional EH&S policies and procedures are properly implemented.

Materials Sciences Division Work on the University of California at Berkeley Campus
Except where noted, this plan applies to work conducted in LBNL facilities but does not apply to work performed by MSD personnel on the campus of the University of California at Berkeley. In accordance with the *Partnership Agreement between UCB and LBNL Concerning Environment, Health and Safety Policy and Procedures (March 15, 2004)*, all campus MSD laboratories implement the ISM program via campus-based mechanisms with the assistance of the campus Office of Environment, Safety and Health.

The requirements described in this ISM Plan apply, as appropriate, to faculty, staff, matrixed staff, postdocs, students, participating guests, visitors, users, vendors and contractors performing work under the management control of MSD.

Division Safety Management Structure

The Materials Sciences EH&S program structure consists of:

- Division Director
- Deputy Division Director
- Facility/EH&S Manager
- EH&S Technician
- Building Managers
- Facility/EH&S Administrator
- Electrical Safety Technician
- SRC Representative
- Division Safety Committee (representative from each LBNL research group)
- Molecular Foundry Safety Subcommittee

- Executive Safety Committee
- EH&S Division Liaison
- EH&S Division Waste Generator Assistant

Principal investigators (PI's) and supervisors are responsible and accountable for implementation of this ISM plan in their labs and workplaces. PI's and supervisors may designate one or more "lab safety coordinator(s)" to assist in the implementation of the ISM plan and serve as a point of contact for EH&S issues. Guests and users may not be so designated without the approval of the Division EH&S Manager. However, while activities can be delegated, the ultimate responsibility for implementing the ISM program cannot be delegated below the level of PI/supervisor.

Line Management Responsibility and Accountability

Principal Investigator's EH&S Responsibilities

All Principal Investigators (LBNL and UCB-based) are responsible and accountable to the Division Director for ensuring that all activities are carried out in a safe manner and in accordance with all Laboratory or UCB EH&S requirements, as appropriate. PI's are responsible for range of EH&S functions, including:

- Ensuring EH&S requirements are integrated into all work activities and the necessary resources/controls are provided in a timely manner to do the work safely
- Creating and communicating meaningful EH&S expectations and holding staff, students and guests accountable for implementing these expectations.
- Identifying the EH&S training requirements and medical surveillance requirements for their staff, students, guests and vendors and ensuring that training and medical evaluations are completed in a timely manner.
- Conducting periodic safety walkthroughs of labs, offices and other workplaces for which they are responsible to identify problems in the facilities, equipment or work practices.
- Participating in scheduled lab inspections with the MSD EH&S Technician (LBNL only) and annually with the Division EH&S Manager and EH&S Liaison (campus and LBNL).
- Preparing, maintaining and renewing required Formal Authorization Documents
- Managing the accumulation, storage and disposal of hazardous waste
- Ensuring that new or significantly modified projects or facilities are reviewed for hazards in the planning stage.
- Conducting periodic safety meetings with supervised staff, students and guests.
- Designating the following:
 - Representative/back up for the Division Safety Committee (LBNL only)
 - Managers/backups for all Satellite Waste Accumulation Areas (SAAs)
 - Lab Safety coordinators, as necessary
 - Crane managers, as necessary

Shared Lab Space and User Facilities

The scientist responsible for lab facilities (at LBNL and on the UCB campus) that are shared with individuals outside his or her research group is responsible for ensuring that the guest/user has been fully trained and complies with applicable EH&S policies,. The lab manager may provide required “on the job training”, or the line manager or others may provide this training, but it is the lab managers’ responsibility to prohibit work from proceeding until training has been completed. This applies equally to user facilities managed by the Division (NCEM, Molecular Foundry) and labs that are informally shared. In general, the Division requires guests to follow the same EH&S procedures and requirements as staff and students. Only the host/assigned scientist can authorize work to be performed by the guest.

Students

The Division ISM plan does not distinguish between students and other personnel working in the Division. Students are afforded the same protections and assume the same obligations with regard to EH&S as other workers at LBNL. Students must complete the same EH&S classes as staff.

Vendors

Division personnel who request or arrange for vendor support for repair or maintenance of equipment should meet with the maintenance technician and advise him/her to follow LBNL EH&S requirements and integrated safety management. The Division provides a form to be used for this purpose where the equipment is electrically powered. Where additional information is required regarding EH&S requirements, contact the Division EH&S Manager for support.

Matrixed Employees/Employees Working in Non-MSD Facilities

Matrixed employees’ supervisors from the home divisions retain all health and safety responsibilities for matrixed employees, except where some of the responsibilities have been transferred to the Division through a formal Memorandum of Understanding. MSD personnel will provide operation-specific training to matrixed individuals.

Assurance Mechanisms

The Division has implemented a variety of EH&S assurance mechanisms, as described below.

Project Hazard Guide

MSD has developed a “Project Hazard Guide” that facilitates the hazard evaluation of work in laboratories. Central to this process is the Project Hazard Guide Questionnaire, which is completed annually by each LBNL-based PI. The form currently lists 41 potential hazards likely to be present in Division work. The responses on the questionnaire are reviewed by the EH&S Manager. Positive responses are used to target

hazard evaluations and inspections of research operations which may require formal authorization or present hazards above the ordinary.

EH&S Component of Performance Appraisal

LBNL staff scientists receive annual performance appraisals. 10% of their assessment is based on their EH&S performance, including their performance in inspections, assessments and reviews conducted during the appraisal year.

One-On-One Meetings with New Students, Postdocs and Staff

The Division Facility/EH&S Manager meets briefly with each new staff member, GSRA student and post doc working for MSD at LBNL to review their planned work, the answers to the JHQ and discuss the LBNL ISM program. This does not apply to guests, users or students working exclusively in UCB laboratories.

Affirmation

All PI's (LBNL and UCB) confirm their EH&S responsibility at least annually through their signature on the MSD Safety Assurance Statement (SAS) which is required for all proposals processed through MSD. The text of this document to be used in 2006-7 is given below.

I have reviewed the impact of the component of the research described in this proposal that will be performed in my laboratories under my direction on the environment and on the health and safety of the staff, students and visitors who will do the work. I certify the following:

1. Proper procedures, equipment, and facilities will be employed and all staff will be properly trained to carry out this work in a safe and environmentally benign manner. In determining that all the procedures, permits, authorizations, and/or approvals required for my new and ongoing projects are in place I consulted with LBNL Pub 3000, the MSD Project Hazard Guide, or UCB safety guidelines as appropriate.
2. **Research in LBNL Main site laboratories.** For all my research projects, regardless of funding source, that are pursued in LBNL space, I have personally inspected all of the laboratory space under my direction and have given a safety presentation to all of the staff, students, and visitors under my supervision at least once in the past year and will do so at least once in the coming year.
3. **Research in UCB laboratories** For all my research projects that are funded through LBNL and pursued in UCB space, I or my designee has personally inspected all of the laboratory space under my direction at least once in the past year using the appropriate checklist for my UCB department and has ensured that the completed checklist has been submitted to the appropriate UCB Department Safety Coordinator with a copy sent to the MSD EHS Administrator. This will be completed at least once in the coming year.

Calendar of Routine EH&S Activities

The Division has developed an annual calendar scheduling 10 routine EH&S activities for labs. Every month, PI's are asked to conduct 1-3 targeted EH&S activities, such as inspecting their waste accumulation areas, reviewing staff and student training or verifying their chemical inventory. The MSD EH&S Administrator sends PI's (and SAA managers, as appropriate) monthly notices regarding the activities scheduled for that month. Use of this tools is voluntary and at the discretion of the PI.

Inspections and Assessments

Bimonthly Technician Inspections

Approximately every other month, the MSD EH&S Technician will inspect each LBNL-based laboratory using a checklist designed specifically for MSD labs. As part of this inspection the technician will review waste management practices, chemical inventory, peroxidizable chemical management, laser safety controls, safety signs, ventilation monitor function, use of personal protective equipment, and other EH&S issues. The technician will communicate problems directly to laboratory personnel and track items that cannot be immediately corrected in the Corrective Action Tracking System (CATS).

Technician/Principal Investigator Inspections

Twice a year the MSD EH&S Technician will perform a laboratory inspection with the principal investigator. The inspection will include the elements of the bimonthly technician inspections as well as reviewing new work, laboratory changes and work practices. The technician will document these joint inspections and track items that cannot be immediately corrected in the CATS database.

Waste Accumulation Area Inspections

The EH&S Waste Generator Assistant and the MSD EH&S Technician will conduct a quarterly comprehensive review of the satellite waste accumulation areas in the Division. The Waste Generator Assistant inspects the building 62 waste accumulation area weekly.

Annual Self-Assessment Inspection

At least annually, the MSD EH&S Manager, EH&S Liaison (LBNL or campus, as appropriate) and the PI will conduct a joint inspection of each laboratory (LBNL and UCB). For LBNL labs the EH&S Manager will document these joint inspections and track items that cannot be immediately corrected in the CATS database. For campus labs, the Campus Office of Environment, Health and Safety will track issues identified during inspections.

Triennial Management of Environment, Safety and Health Assessment (MESH)

As required by the SRC, the Division will participate in the MESH review that evaluates management systems and implementation of ISM requirements. This review is run by the Safety Review Counsel and typically includes representatives from the Office of Contract Assessment (OCA) and EH&S Division. MSD completed the MESH review in 2006.

Program Reviews

The EH&S Division is developing a program review process to examine specific safety topics in details. Examples would be laser safety, electrical safety and crane safety. MSD will participate in this review program as requested.

Training

LBNL Policy generally allows:

- New employees, participating guests and students to work for up to 90 calendar days without completing required institutional training unless the training is required by a formal authorization document.
- Employees, Guests, Students, Contractors with appointments of 30 calendar days or less are not required to complete most institutional EH&S training and do not need to fill out the Job Hazards Questionnaire (JHQ).
- “Occasional Guests, Students and Contractors” are not required to complete institutional training but must be under constant supervision by a trained individual.
- Training specified in formal authorization documents must be completed prior to starting work.

MSD has a somewhat different policy for training:

- Participating guests (including users at the Molecular Foundry and National Center for Electron Microscopy) who work at LBNL for fewer than 7 continuous days may do laboratory work without LBNL training or completion of the JHQ but only under the continuous line-of-sight supervision of someone who is trained for that work.
- New staff, students and post docs are allowed to work under line-of-sight supervision for 7 days prior to training or completing the JHQ.
- Due to the limited availability of the EHS0604 “Hazardous Waste Generator” class, all people new to LBNL may generate hazardous waste for 30 days by completing EHS0623, “Hazardous Waste Generator for Guests”. After 30 days they must complete EHS0604 to continue generating waste.
- This 7 day grace period does not apply to all training, although the EH&S Division has not yet clearly defined this distinction in most cases. By Division policy this 7 day “line of sight” proviso does not apply to:
 - EHS 250 series electrical safety classes in the EHS250 series
 - EHS274, 275 and 277 in the confined space series
 - EHS310-315 in the respiratory protection training
 - EHS410-418 X-ray machine safety for operators, supervisors and maintenance personnel
 - TMF10, Integrating EH&S Into Science at the Molecular Foundry
 - MSD010, Introduction to EH&S for New MSD Students, Staff and Guests
- After 7 days all individuals must complete the JHQ to facilitate the identification of training requirements and must complete the required training prior to starting/continuing work for which training is required.
- EHS260, Basic Electrical Hazards and Mitigations, is not required for guests/users at NCEM and the Foundry who will not perform work that potentially exposes them to >50 volts (e.g. equipment maintenance, repair, construction). The MSD EH&S group will wave this class in the database after

verifying that the individual will not be performing work where he/she will actually be exposed to electrical hazards.

- Training classes subject to the 7 day grace period may be waived by the supervisor by providing substantial evidence to the MSD EH&S Manager demonstrating that the individual has equivalent training at another institution. The final decision on training class waivers is the EH&S Manager's.
- UCB: Campus personnel must be trained to safely perform the work they will do. All campus-based students and post docs must complete the JHQ. The LBNL classes that are recommended by the JHQ process are available to UCB personnel. Campus personnel may be trained by attending LBNL classes, campus classes, on-the-job training or other means deemed adequate by the principal investigator.

Training is available in a number of ways, including:

- On-line at the Institutional Training Web Site (e.g., TMF010)
- On line at the MSD web site (e.g. MSD010)
- Via CD available from the EH&S Administrator (e.g. EHS060)
- Via attendance at class
- By supervisor exemption. A supervisor may exempt an employee/guest from a required training class if the employee/guest has already been trained for a particular hazard by a combination of prior experience [includes training classes taken at other institutions] and/or on-the-job training. This exemption must be proposed to the Division EH&S Manager.

Medical Surveillance

Few MSD personnel are required to participate in a medical surveillance program. The common exceptions are:

- Laser Eye exam (EHS 280): Must be completed prior to working on a class 3b or 4 laser system unless under direct line-of-sight supervision by a PI or fully qualified individual designated by the PI. Must be completed within 30 days of starting work with a class 3b or 4 laser system even if fully supervised
- Respiratory protection medical review: Must be completed prior to starting work where a respirator is required.

Communication and Feedback

MSD employs a variety of tools to facilitate communication of EH&S issues.

- Materials Safety—A short safety bulletin addressing a single, timely EH&S issue. Members of the Safety Committee are asked to bring topics to the attention of the EH&S Manager for consideration as an edition of Materials Safety. Suggestions may also come from any Division employee, student or guest.

- Division Safety Committee—Representatives from all LBNL-based research groups attend a quarterly Division Safety Committee meeting to review Division EH&S performance and incidents, discuss problems and support the self assessment process. The committee is chaired by the Facility/EH&S Manager and includes the Deputy Director (*ex officio*), the EH&S Technician, the Electrical safety technician, building managers and the liaisons from the EH&S Division.
- Molecular Foundry Safety Subcommittee—Drawn from the Division Safety Committee, the subcommittee includes representatives from each Foundry program. It meets on an *ad hoc* basis.
- Research Group Meetings—Each PI meets with members of his or her research group and EH&S topics must be discussed at least quarterly. At least annually, the EH&S Manager will attend one of these group meetings to facilitate the safety discussion
- EH&S News Boards—Glass-enclosed bulletin boards dedicated to EH&S issues have been installed strategically in MSD-managed buildings (2, 62, 66, 67, 72, total of 16 cabinets). These are used to post timely EH&S information such as the monthly schedule of EH&S activities and recent editions of Materials Safety.
- Annual PI meeting—A review of Division EH&S performance and prospective look at initiatives for the coming year is presented at the Division Strategic Planning Meeting every year. All Division PI's are required to attend this important meeting.
- Hazard Communication Sign—MSD has developed a greatly enhanced hazard communication door sign that is being phased into use, starting in the Molecular Foundry. PIs are responsible for maintaining and updating the hazard communication sign when the hazards or people change. Contact the MSD EH&S Administrator to have new signs created and posted.

Institutional EH&S Databases

MSD actively participates in the management of Division data in the following institutional EH&S Databases:

- Chemical Management System (CMS)
- Supervisors Accident Analysis Report (SAAR)
- Hazards, Equipment, Authorizations Report (HEAR)
- Corrective Action Tracking System (CATS)
- Job Hazards Questionnaire (JHQ)
- Laser inventory Database
- Activity Hazard Document database (AHD)

Authorization of Work

Formal Authorization

Approximately 30 Division operations are “formally authorized” via Activity Hazard Documents (AHDs), X-Ray Authorizations, Human Subjects Approvals or other institutional mechanism. These authorizations are contracts between the PI, the Division and the institution that bind the PI to a set of safety conditions and requirements. These contracts are inviolate; if the PI or others working in the lab cannot meet the conditions of the work authorization then work must be suspended until changes can be made in the work, controls or authorization document.

PI's are responsible for recognizing when they are planning work that requires formal authorization and obtaining that authorization prior to starting work. The institutional triggers for formal work authorization can be found in Pub3000, the MSD Project Hazard Guide and the slides from MSD/EHS026 “ISM for PI's and Supervisors” class.

Individual principal investigators prepare AHDs. Principal investigators may appoint work leaders to assist in the preparation and maintenance of their AHDs, but they may not delegate their responsibility for these actions. AHDs are initially authorized by the Division Director and annually reauthorized by the Facility/EH&S Manager. If the scope of work changes substantially, resulting in increased hazards, the EH&S Manager may, at his discretion, request the Division Director to reauthorize the AHD. All AHDs will be transferred to the on-line AHD database before the end of FY07.

Maintenance of formal work authorizations is the responsibility of the PI. The PI must update his or her AHDs at least annually or immediately whenever the work changes such that new personnel or hazards are involved. All researchers, including users and guests participating in research that is authorized via an AHD must be added to the electronic AHD before starting work (does not apply if the guest is not actually performing potentially hazardous work; does not apply for up to 7 days during which the user is under line-of-sight supervision by a trained individual). For the radiological authorizations (other than X-Ray), it is necessary to notify EH&S in advance of new or short term users, guests or students.

Line Management Authorization

Work that falls below the threshold for formal authorization is authorized by the principal investigators/supervisors. The Project Hazard Guide Questionnaire is one mechanism that is used to authorize work. The answers to this questionnaire are reviewed by the Division Facility/EH&S Manager to ensure that work authorizations are appropriate and to target further hazard assessment activities.

Work by users at the Molecular Foundry is authorized by the lead or staff scientist assigned to the work via the “Molecular Foundry Work Authorization Record”. It is anticipated that this process will be converted from a paper system to a computer-based system within FY07.

The Molecular Foundry

Each user proposal to the Molecular Foundry is screened by the Division Facility/EH&S Manager twice to identify EH&S requirements. As part of the initial proposal submission process, the prospective user answers 7 key EH&S questions that pertain to high hazard activities. This allows the identification of proposed work that falls outside of the safety envelope of the facility or that will have significant cost or administrative impacts.

Accepted proposals go through a second, comprehensive EH&S review intended to identify appropriate training, formal authorization requirements, additional engineering or personal protective controls and the need for government permits.

The Foundry scientist responsible for each accepted proposal will authorize the work to proceed only when all of the requirements identified in this EH&S review have been implemented. Authorization of work requires the user and the managing Foundry scientist to cosign a Work Authorization Record that summarizes the EH&S requirement and affirms that the user has met all of the requirements and will seek further authorization if the scope of his or her work changes.

Prior to starting work in the Foundry, all users and guests must complete the on-line training class TMF010, "Integrating EH&S into Science at the Molecular Foundry". All users of class 3b and 4 lasers must complete the institutional laser training prior to working directly with lasers in the Foundry.

The Foundry is instituting the consensus document on nanoscale safety developed by the five DOE Nanoscale Research Centers (*Nanoscale Science Research Center: Approach to Nanomaterial ES&H* dated 8/2/06).